



## Zumba®!: An Antidote for Uncontrolled Weight Gain Associated with Polycystic Ovarian Syndrome with Subclinical Hypothyroidism?

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### Abstract

**Background:** Polycystic Ovarian Syndrome (PCOS), a variant of anovulatory cycles, presents with an estrogen dominance with low progesterone, sometimes leading to Subclinical hypothyroidism (SH). This case study is about a 31 year old woman with the inability to conceive, who was diagnosed with PCOS. Since her diagnosis 12 years ago, she has been to many physicians who have been unable to successfully manage her "mystery case". She currently has all the symptoms of PCOS with weight gain, hirsutism, hyperlipidemia, and Type II Diabetes Mellitus, for which she took Metformin, and could not bear the side effects. Recently, she discovered a goiter in her neck. This case study examines the etiology of PCOS, leading to SH, and the battle with increasing weight loss success.

**Methods:** Laboratory data and logs of weight changes of the subject between years 2007-2013 was utilized. After being diagnosed with PCOS, the patient was prescribed the following regimen: 1) diet, 2) family support 3) OCP, Ca<sup>2+</sup>, Metformin, Vitamins, fat burners, and colon cleansers 4) moderate- vigorous Physical Activity-Zumba. The subject was reevaluated every three months with a physical exam and hormone lab tests; ELISA for Anti- peroxidase was also performed.

**Results:** Physical exam revealed a goitre, but most recent ELISA test ruled out Hashimoto's (anti-microsomal antibodies). Estradiol=1.8 pg/mL (N=1.3-2.3), Progesterone=11 pg/mL (N=75-270), Pg/E<sub>2</sub> Ratio=6 (Optimal=100-500), Testosterone=17 pg/mL (N=16-55), DHEA Sulfate=287 (N=39-232), Morning Cortisol=3.8 ng/mL (N=3.7-9.5), LDL=118 (N=0-99), Cholesterol=233 (N=0-199), Free T<sub>3</sub>=2.5 pg/mL (N=2.3-4.2), Free T<sub>4</sub>=0.91 (N=0.73-1.95), Thyroid peroxidase Ab<1 IU/mL (N<9 IU/mL), and Ultrasensitive TSH=2.810 IU/mL (N=0.500-4.7). The patient lost 83 pounds between 2008-2010 with the original treatment regimen that included 14 prescription drugs. After intervention in 2012 the subject had a 3% decrease in BMI.

**Conclusion:** The study concluded that weight loss success was achieved through the following: 1) moderate-vigorous physical activity: High-Impact Zumba, spousal, physician, and family support; self-motivation; self-empowerment; and optimism.

**Keywords:** Zumba; Polycystic ovarian syndrome; Subclinical hypothyroidism; Weight loss success; Physical activity; Informal support; Self-motivation; Self-empowerment; Optimism

### Introduction

#### Review of literature

Among women in the United States, Polycystic Ovarian syndrome is the most common reproductive endocrine disease; the prevalence ranges between 6 and 10 percent as stated by the National Institutes of Health [1]. Polycystic Ovarian Syndrome (PCOS), a variant of anovulatory cycles, presents with an estrogen dominance with low progesterone, sometimes leading to Subclinical hypothyroidism (SH).

#### Etiology of PCOS leading to subclinical hypothyroidism

How is it possible that a patient could acquire Subclinical Hypothyroidism from the inability to manage PCOS? Understanding this disease process requires knowledge of normal physiology and subsequently the consequences of abnormal. The disease process and sequelae is complex and multifactorial. In PCOS, women experience abnormal menstrual periods as Estrogen is at a level much higher than normal due to multiple estrogen-producing cysts on the ovaries. Estrogen dominance is the result of estrogen-producing cysts, drastically decreasing a woman's chance to conceive since increased Estrogen will inhibit follicle stimulating hormone (FSH) and prevent ovulation required to conceive, and prevents the transition into the luteal phase of her cycle. Therefore, she does not have adequate progesterone, which normally would balance out estrogen. However, she will have increased precursors to progesterone, DHEA Sulfate,

which is androgenic (steroid). This hyperandrogenemia leads to water weight gain as steroids hold onto water, the hirsutism, acne, deepened voice tone, polycythemia, and of course increased appetite all associated with PCOS. Normally, steroid hormones break down proteins and convert them in glucose, leading to Type II Diabetes Mellitus [2].

The disease can be difficult to manage if not properly diagnosed. If not well managed, a woman with PCOS can end up with decreased thyroid function or Subclinical Hypothyroidism; if the condition is not caught early enough, the patient may become fully hypothyroid. Under normal conditions estrogen behaves as a vasodilator, a muscle relaxant, and stimulates protein synthesis. During the course of PCOS, the Estrogen Dominance (ED) stimulates estrogen receptors in thyroid tissue which then will inhibit the transcription of Sodium-Iodine transport channels [3], mimicking an iodine deficiency hypothyroidism. Iodine deficiency is the most common cause of hypothyroidism, followed by drugs like Amiodorone [1]. Additionally, the ED will also

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cause increase in protein synthesis and labs will reveal an increased Thyroid Binding Globulin (TBG) and decrease the thyroid's iodine uptake capabilities [4]. The ED in PCOS may have implications in the formation of a goiter [5] (Figure 1).

### Case Presentation

This case study is about a 31-year old woman with the inability to conceive, who was diagnosed with PCOS. Since her diagnosis 12 years ago, she has been to many physicians who have been unable to successfully manage her "mystery case". She currently has all the symptoms of PCOS with weight gain, hirsutism, hyperlipidemia, and Type II Diabetes Mellitus, for which she took Metformin, and could not bear the side effects. Recently, she discovered a goiter in her neck. This case study examines the etiology of PCOS, leading to SH, and the battle with increasing weight loss success. The entire thing started when she tried to commit suicide after she could not conceive. She was sexually assaulted and tried to kill herself on the railroad tracks. She did not want to die but she wanted more attention from the doctors for her condition. She then started bleeding for 4 weeks and 2 weeks without bleeding. Doctors were telling her to run more eat less. She was a size 14 and after she got married and tried to conceive and started gaining weight. The doctor performed an intrauterine ultrasound and found cysts on her ovaries. They immediately began treating with OCP and the weight gain persisted. The other specialist physician found difficulty in combining all the symptoms together to figure out the proper diagnosis, as PCOS may not always lead to SH. She reports that only the primary physician listened to her and supported her. The

subject experienced times where her husband became frustrated at the Endocrinologist and demanded that she listen actively to his wife.

She had problems with some of the prescribed medications; for example, Metformin caused her to have heart palpitations and she had too much fat around her heart. She continued to have sleep apnea and weight gain. She was taking progesterone cream and started feeling a little better. As the PCOS persisted, she was tested and found to be positive for Estrogen-Sensitive Breast cancer and has since then had both breasts removed. A Gynecologist suggested in-vitro fertilization and she refused due to religious beliefs. She stopped taking OCP to start trying to conceive, and has gained 100 pounds since 2002. The weight gain persisted despite treatment.

She declares, "I'm a huge advocate because no one seems to know that much about PCOS". The subject struggled for years and has participated in various weight loss programs, eating exactly what was advised, and watched caloric intake. The subject's theory is that since she moved from the Gulf of Mexico region, she believed she had since become iodine deficient, which would accompany her PCOS, contributing to her metabolic syndrome. After marrying, she stopped taking OCP and tried for a baby but could not conceive. She gained many 90 pounds within 3 years despite her exercising efforts. The subject feels as if she had to force the doctors to hear her out as she had been having horrible menstrual cycles with a pattern of 4 weeks on and 2 off. Eventually, her physician found a uterine cyst the size of grapefruit that was immediately removed. The physicians immediately prescribed her OCP to help regulate her menstrual cycles and weight-by this time she weighed 269 pounds. The physicians found that she also had sleep

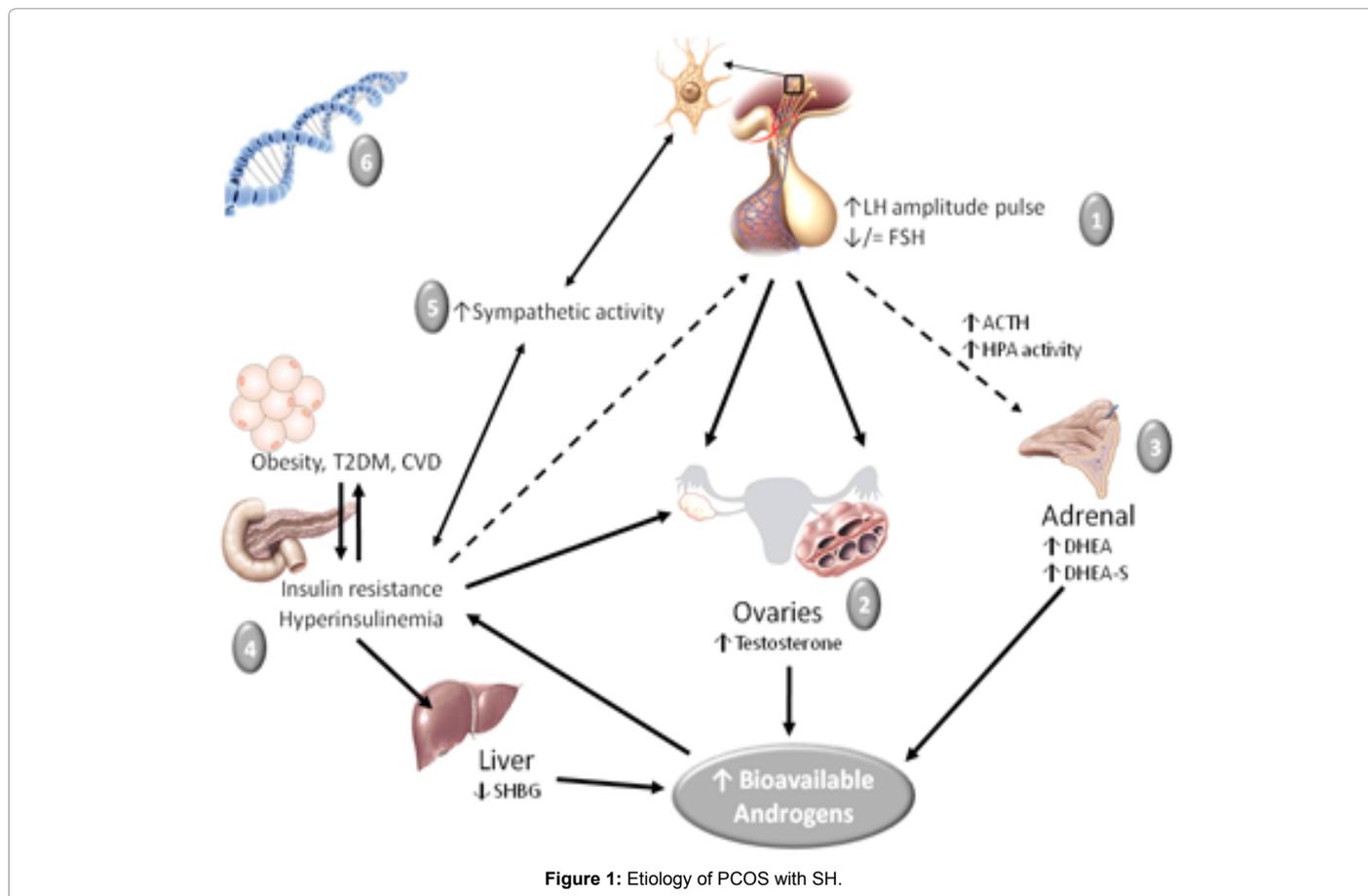


Figure 1: Etiology of PCOS with SH.

apnea, which is common with PCOS and obesity. Coupled with her metabolic issues was her enlarged heart, and she was therefore placed on a nutritional plan consisting of 600 calories of protein only for about a year and resulting in a loss of 83 pounds. Started with just one capsule of seaweed daily she started to feel much better. The chronic fatigue she experienced, although the loss was significant, the subject gained 30 pounds of it back in 2011, and another 23 pounds before intervention in 2012. When her doctors conducted an MRI they found a goiter, but were unable to explain the pathophysiological rationale for the goiter, as she had primary hypothyroidism at this point. Through her own research she found out the seaweed helps her symptomatology of PCOS. At times, she felt dizziness, nausea, heart palpitations, and breathing problems during meals. She from her undiagnosed Subclinical hypothyroidism has made exercising difficult for her. Her thyroid symptomatology had been present for 3 years, which is when she began gaining back the weight she lost.

The subject feels that there is a need for physicians that actively listen, who are attentive, and attempt to treat the whole person, as she has met many women with her same story. She asserts that she takes very good care of herself and is persistent in her battle for weight loss success with her condition (Figure 2).

## Management

A recent study conducted by [6] finds that implementing a structured physical activity program will help improve cardiopulmonary function and decrease BMI, and increase insulin sensitivity in women with PCOS. The researcher, as part of the management team, suggested moderate-vigorous physical activity that included Zumba and light weight lifting, or High Impact Zumba. What is Zumba®? Zumba® is an aerobic Latin-inspired fitness dance program created in 1990. It combines various types of dance like Hip Hop, Soca, Salsa, Merengue, and Cumbia with squats, lunges, and other exercise movements. The High Impact Zumba® is the same but with small weights in-hand. These fitness classes last usually about an hour or more and participants can burn more than 700 calories in that hour (<http://en.wikipedia.org/wiki/Zumba>). The subject says she feels that after battling 12 years with PCOS, doing Zumba® is the only thing that has helped her to lose weight. The subject feels assured talking to someone that knows the science. Many of her friends criticize her saying she needs to exercise harder. The researcher, a Biomedical Gerontologist and Doctor of Medicine Candidate, through active listening and thorough assessment, established an effective working partnership with the patient, and addressed the patho-physiological mechanisms responsible for her metabolic syndrome, and the psycho-social factors which contributed to a positive therapeutic outcome.

It began when the researcher saw a post about her battling PCOS and encouraged that she joins the High Impact Zumba® classes and participate at least 3 days a week. The researcher provided clinical insight and implied that she may have subclinical hypothyroidism after seeing her labs and actively listening to her symptomatology.



Figure 2: 31-year old woman diagnosed with PCOS.

Her primary physician was diligent and never gave up on her, but he was limited and had to refer her to specialists who also never could solve this “mystery case”. So since the researcher advised her to be assessed for Subclinical Hypothyroidism, it was finally discovered as the subject had a goiter; her subclinical condition progressed to becoming fully hypothyroid. Although the subject was unfortunately diagnosed late, she is now finally being properly treated. Every 4-6 weeks her Ultrasensitive TSH was being measured and every 6 weeks she received a new lab panel. Laboratory data was collected from 2007-2013 from this patient. However, this study utilizes the most recent lab data December 22, 2012. The subject submitted her vital signs, weight log, and lab data with the glucose levels, including DHEAS, which was drawn every three months. She is on a diet that consists of high protein, low carb or low glycemic carbs only, as her HbA<sub>1c</sub> was increased during the last assessment. The doctors placed her on 75 mg Levothyroxine (*L-Synthroid*). The T<sub>3</sub>/T<sub>4</sub> (free T<sub>4</sub>=1.06; N=1.9 desired) was measured on January 21, 2013. Since the T<sub>3</sub>/T<sub>4</sub> levels were less than optimal, the patient is now at a dose of 125 mg of Levothyroxine (*Synthroid*) and maintaining a good basal metabolic rate and managing the weight associated with her metabolic syndromes (Table 1 and 2) [7].

## Informal support

It can be difficult to battle a disease alone, and having moral support can alleviate stress and prevent the disease from becoming worse. Through the course of her metabolic syndrome, the subject received the greatest support from the husband and the primary care physician. After she had both breasts removed due to the onset of estrogen-sensitive breast cancer, her husband was still very affectionate and supportive and exclaims he “loves” her “with no boobs!”

Her physician would listen to her for 30 minutes to try to achieve an appropriate diagnosis. Her sister is involved in Zumba® classes and encouraged her to go to the classes as well. She and her sister live in the same vicinity; she feels more connected to her sister and she knows a lot about the disease process. They both use the “Lose It” application on their smartphones, and collaborate in order to keep track of their weight loss success, and therefore there is a sense of accountability in their partnership. In regards to her family history, endometriosis, and an estrogen-related disorder affects her sister; her grandmother had cervical cancer when she died, while her mother had a large tumor in the cervix.

In addition to the PCOS support group she joined in 2012, the subject also feels supported by her management team which includes her Primary Care physician and the researcher whom intently worked to listen to her, investigate the pathophysiological processes behind her symptomatology, and employed an intervention. The primary care physician then treated her as a whole person. She says “These two practitioners were compassionate and pushed past science and the medical model and viewed my case as any doctor should: mine.” For many years she felt like just another number in the patient room. She declares that lab results are a guide for physicians, but she wanted to be treated as a whole person; she felt that her physicians executed effectively using the following skills: listened actively, reviewed and then treated her as a whole person.

## Patient self-motivation

Bonnie is a mother of one child, and every day she is reminded that she has a daughter and a husband to care for, so she gets up and fights this disorder. She refuses to be a burden to her husband, daughter and dogs. She wanted to feel 100 percent well, and it is hard for her to work in her garden as she tried to avoid the suffering.

Patient: Bonnie		Date: December 22, 2012
Lab test	Patient	OPTIMAL
ELISA - Thyroid Peroxidase AB	<1	<9
Estradiol	1.8 pg/mL	1.3 – 2.3 pg/ mL
Progesterone	11 pg/mL	75 – 270 pg/mL
PG:E2 Ratio	6	100 – 500
Testosterone	17 pg/mL	16 – 55 pg/mL
DHEAS	287	39 – 232
Morning Cortisol	3.8 ng/mL	3.7 – 9.5 ng/mL
LDL	118	0 – 99
Cholesterol	233	0 – 199
Free T3	2.5 pg/mL	2.3 – 4.2
Free T4	0.91 pg/mL	0.73 – 1.95 pg/mL
Ultrasensitive TSH	2.810 IU/mL	0.500 – 4.7 IU/mL

Table 1: Hormone lab tests.

Factors	Description
Zumba	Physical activity 3 days/week 1 hour+with light weights
Spousal support	Husband was supportive morally and works out with her
Diet	High protein low carb or low glycemic carbs only
Physician support	Physician was a good listener and advocate for his patient and proper dx
Self - motivation	She wanted to be alive for her child and husband, kept positive attitude & diligence
Optimism	She started a knitting non-profit "Bonnie's babies" for babies in the NICU ensuring she "has" hundreds of kids since she can't conceive

Table 2: Patient management.

### Changes in attitude, optimism, and behavioral changes

Her sister and husband are present giving her energy and encouragement to work out and continue being active as he exercises daily as well. Anti-depressant drugs were not working. It was hard to admit she had a mental health problem or major depression due to her symptoms and what she has lost. It took 5 years for her to progress from major depression to increased activity. Her primary care physician was attentive and very open and honest with her and that allowed her remember who she used to be. At times, she would go to the grocery store and would see babies with their parents, and would want share that experience with her husband again as well. Her hobby is to crochet and quilt, and she therefore created a non-profit organization called Bonnie's Babies for babies in the Neonatal Intensive Care Unit (NICU). So in this way, she is able to care for many babies. Rather than obsessing over the idea that she cannot have kids, she is involved in the lives of others in this way and so that allows her to buffer her depression. This effort gives her life meaning. She continues on a low glycemic index foods and physical activity, namely, High Impact Zumba® and light weight lifting.

### Outcome

Physical exam revealed a goiter, indicating primary hypothyroidism, but most recent ELISA test ruled out Hashimoto's (anti-microsomal antibodies). Estradiol=1.8 pg/mL (N=1.3-2.3), Progesterone=11 pg/mL (N=75-270), Pg/E<sub>2</sub> Ratio=6 (Optimal=100-500), Testosterone=17 pg/mL (N=16-55), DHEA Sulfate=287 (N=39-232), Morning Cortisol=3.8 ng/mL (N=3.7-9.5), LDL=118 (N=0-99), Cholesterol=233 (N=0-199), Free T<sub>3</sub>=2.5 pg/mL (N=2.3-4.2), Free T<sub>4</sub>= 0.91 (N=0.73-1.95), Thyroid peroxidase Ab<1 IU/mL (N<9 IU/mL), and Ultrasensitive TSH=2.810 IU/mL (N=0.500-4.7) (Table 3).

### Discussion of outcome

After initiating the original treatment regimen in 2008 regimen,

she lost 83 pounds and began to slowly regain the weight, and then she gained back 53 pounds. The subject lost 83 pounds between 2008-2010, and as she became hypothyroid, she gained back 53 pounds between 2010-2012. The High Impact Zumba® that includes light weight lifting has allowed her to begin shedding the 53 pounds by going 3 days a week for 1 hour and 30 minutes. Each session allows her to burn 700 calories or more in an hour; her favorite is the booty line-up. Since the proper diagnosis, intervention, and treatment the patient has nearly a 3% (2.94 percent) decrease in her body mass index (BMI), which is significant weight loss success for patients with PCOS and SH. The chronic fatigue that comes with hypothyroidism was lessened as she takes 125 mg of Levothyroxine. This allows her to continue exercising in attempt to manage the weight gain in PCOS with SH.

She also reports that she is now feeling better, having lost 9 pounds, and declining. The subject says that she has gone down 2 dress sizes and 2 pant sizes, and has gained muscle in the legs and tone. This is a big accomplishment as she not been able to gain muscle in the past. The drug regimen has been reduced from 14 prescription drugs to 3 currently, since the proper diagnosis. Her PCOS support group has also made her feel comfortable and she participated in the PCOS Awareness Walk, where she saw other women with whom she could identify. She also follows the support group's blogs. Seeing one other woman in the booty line-up who suffers from PCOS, who has also shed many pounds, also provides motivation and encouragement, helping increase her weight loss success.

### Conclusion

This case has provisionally shown a favorable progression toward outcome, despite complications. This is due both to medical treatment and other factors such as informal support, health promotion, and a proactive patient. Issues in the medical treatment included some failure of specialist physicians to treat the whole person, including careful hearing of the patient's accounts, feelings, and insights.

### Implications and Applications

#### Implication

This study has implications for Integrative medicine and holistic management of women struggling with weight gain in PCOS with SH and other metabolic syndromes. Some clinicians understand that it is easy to misdiagnose a patient with Subclinical hypothyroidism. The name "subclinical" indicates that it is not clinically diagnosed, however, healthcare policy should be implemented that would make it clinical practice for practitioners to diagnose subclinical hypothyroidism. This is critical as thyroid hormone is permissive to all other hormones and therefore a patient with thyroid dysfunction, unless detected, cannot be properly diagnosed or treated for their metabolic syndrome.

Lastly, an important component is basic active listening to a

Year	Weight	BMI (kg/m2)	Class	Disease Risk
2007	269	37.5 kg/m2	Obesity III	Extr. High
2008	269	37.5 kg/m2	Obesity III	Extr. High
2009	200	27.9 kg/m2	Overweight	Increased
2010	186	25.9 kg/m2	Overweight	Increased
2011	216	30.1 kg/m2	Obesity I	High
2012**	239	33.3 kg/m2	Obesity I	High
2013*	230	32.1 kg/m2	Obesity I	High
**	Pre-intervention			
*	Post-intervention			

Table 3: Weight changes from 2007- 2013.

patient's account of symptoms, perceptions, feelings, and ideas regarding treatment. Such skills in treating the whole person could be more-fully incorporated into medical training. A further issue is that technological innovations, particularly availability of health and medical information on the Internet, have strong potential to empower patients to self-advocate and influence treatment choices.

### Application

Increasing weight loss success was achieved through the application of the combination of the following factors: Zumba®; spousal, physician, and family support; self-motivation; self-empowerment; and optimism (Figure 3).



**Figure 3:** Application of Zumba.

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